FOS CDR RID Report

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Originator Paul Hwang
Phone No 301-286-6968
Organization 422
E Mail Address Paul.Hwang@gsfc.nasa.gov
Document FOS CDR

RID ID **CDR** 10
Review FOS
Originator Ref
Priority 2

Section **Page** **Figure Table**

Category Name Requirements **Actionee** ECS
Sub Category
Subject System Engineering for future missions after AM-1.

Description of Problem or Suggestion:

As a result of “systems engineering for future missions after AM-1”, a road map to support future missions” is lacking.

Originator’s Recommendation

Develop a “road map to support future missions after AM-1”, which shall summarize the need of modifications by each subsystem, impact on the overall system, operations, etc.

GSFC Response by: **GSFC Response Date**

HAIS Response by: Andy Miller **HAIS Schedule**
HAIS R. E. Scott Carter **HAIS Response Date** 11/17/95

The answers to RID # 10 and RID # 11 have been combined because, in the FOS development team opinion, they share the same logical context. In fact, RID # 11 asks for the assessment of the impacts of new EOS missions on the FOS design and RID #10 asks for the description of the process that will be applied to refine that assessment.

A. Probably Impacts by Future EOS Missions to the FOS Baseline

A complete assessment of the impact of new missions on the present FOS design is limited by the fact that a number of variables that should be factored are not quantifiable at the present time. While variables like the Lines Of Code (LOC) necessary to implement generic and AM-1 mission-specific requirements are available and accurate to the extent possible at this post-CDR stage of the project, several other elements can only be qualitatively assessed. The main categories of variables involved in the process include:

- Assessment of LOC to implement a new set of mission specific requirements;

- Level of commonality between mission specific for AM-1 and other S/C (e.g., an equivalent "SRR Analysis" kind of functionality could be largely reused or could require a completely different design approach, or even, not be required at all, depending upon the S/C manufacturer's design);

- Potential impacts of changes on the overall EOS ground system concept presently under evaluation (e.g., EDOS rescoping can result in a set of requirements for FOS functionality not presently included at all in the baseline);

- Ad-hoc glue-code can be necessary to integrate already available functionality (e.g., product repackaging for different mission control center "sizes".)

A table summarizing the preliminary assessment of the potential impacts of future missions on the "as-designed" FOS is included.

Subsystem Name	Subsystem Percentage [%]	Potentially Reusable [%]
Analysis Subsystem	5	72
Command Subsystem	3	82
Command Management Subsystem	15	80
Data Management Subsystem	19	61
FOS User Interface	20	89
Planning and Scheduling	24	75
Real-Time Contact Subsystem	5	91

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FOS User Interface	20		89
Planning and Scheduling	24		75
Real-Time Contact Subsystem	5		91
Resource Management Subsystem	5		100
Telemetry	5		91
FOS	**100**		**78.5**

The table reports the following information:

- name of subsystem impacted;
- size of the subsystem w.r.t. the entire FOS (percentage);
- percentage of potential reuse for each subsystem - note: this is based on the presently estimated ratio between mission-specific and generic LOCs for the AM-1 mission;

The last row provides an overall FOS-wide estimate of the potential reuse as it can be presently projected. Such overall potential reuse factor is estimated to be 78.5%. Pending all the unknown factors previously listed and factoring in what is presently known and what can reasonably be foreseen to be the design of new spacecraft, the FOS team believes that the level of reuse for future missions should range between 70% and 90%.

The primary element that could affect the actual level of code reuse is, of course, the design of the future spacecraft. The general rule is that the more it deviates from the AM1 design, the bigger the impact to FOS. A list of the spacecraft-related areas that pose the most potential for impacting the current FOS design follows:

- the format of the Project Data Base, as defined in the Data Format Control Document;
- the design and size, relative to science data collection rates, of the solid state recorder;
- the implementation of the telemetry and command CCSDS protocol;
- the methods used for dumping and managing on-board memory;
- the design of the stored command processor and how it manages absolute and relative stored commands.

B. Road Map to Support Future Missions After AM-1

The FOS maintains an inventory that describes each of the supported functions at a detailed level. This functional inventory has been kept updated during each phase of the development life-cycle, as finer levels of granularity of the functionality became known. FOS will continue to follow this approach during the coding, integration and testing phases. LOC estimates are mapped to each new identified functionality. This modular functionality breakdown will facilitate the insertion of new functions and rapid cost/benefit analyses. The functional inventory and associated LOC estimates will also assist in the analysis of future spacecraft designs.

The FOS also has system engineering support in the current contract to work with future flight projects, such as PM and CHEM, to evaluate early spacecraft designs and concepts. This provides the opportunity to assess impacts on the FOS design and to perhaps even influence the spacecraft design. One of the main goal is to establish a dialogue early in the process with both flight project and spacecraft contractor personnel. Once work on a new mission like PM-1 begins in earnest, the existing FOS level 4 requirements will be analyzed to determine what new, mission-unique requirements need to be added.

Status **Closed** **Date Closed** **3/4/96** **Sponsor** **Johns**

****** **Attachment if any** ******